REMARKS

The application has been carefully reviewed in light of the Office Action dated March 10, 2004. Claims 92, 95 and 97 have been amended to afford proper dependency from claim 88. Claims 88, 92-95, 97-121 and 123 are pending in the present application.

Claims 88, 92-95, 97-100, 105, 107-118 and 123 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Stone (U.S. Patent No. 5,770,476) in view of Jacobs et al. (U.S. Patent No. 4,811,082) in further view of Kumazawa et al. (U.S. Patent No. 5,569,960). Reconsideration and withdrawal of this rejection is respectfully requested.

Claim 88 recites, a process for forming an interposer element for use as a chip carrier comprising the steps of "providing an insulating layer on at least one surface of a silicon substrate" and "processing the insulating layer to produce at least one passive circuit element on or within the insulating layer, said at least one passive circuit element being separated from said silicon substrate by a portion of said insulating layer, said portion of the insulating layer having a thickness such that at least one passive circuit element is electrically shielded from the silicon substrate." Claim 88 further recites "solder bonding at least one integrated circuit chip to the interposer element, by forming a plurality of individual solder ball leads, wherein two or more of said individual solder ball leads use differing types of solder having differing melting points, such that at least one integrated circuit chip is electrically connected to at least one passive circuit element" and "forming a metallization pattern on or within the insulating layer, the metallization pattern being connected with said at least one passive circuit element."

The device of Stone discloses an interposer that provides passive electronic components in circuit boards or cards. The device of Stone teaches the use of plated

through holes 5 for electrically connecting components to various conductive planes. The Office Action acknowledges that Stone fails to teach or suggest an insulating layer on at least one silicon substrate; wherein the passive circuit element is being separated from the silicon substrate by a portion of the insulating layer; wherein two or more of the individual solder ball leads use different types of solder having differing melting points, and a portion of the insulating layer having a thickness such that the passive circuit element is electrically shielded from the silicon substrate, as recited in claim 88.

The device of Jacobs discloses an integrated circuit packaging structure which provides high circuit density, high speed characteristics of wafer scale integration, reduced power requirements, discrete semiconductor segments, low electrical noise levels and thermal expansion matching between the discrete semiconductor segments and the substrate. "An extremely quiet electrical environment, which exists in the present wafer scale integration emulation package, is an absolute requirement for such reductions in the amounts of drivers/receivers. The structure shown in FIG. 2 and described below provides such an environment wherein each interposer 9 can electrically emulate a large wafer scale integration chip or wafer, and have the corresponding reduced number of drivers and receivers on each semiconductor segment 32." See Column 7, lines 59-67. A component contributing to a quiet environment is alternating signal lines and power lines on each layer 25, 23 and three-dimensional power planes contribute to the quiet electrical environment. The three dimensional power planes comprise a plurality of interconnected X and Y power lines from layers 23 and 25 which is best shown in FIG. 4. See Column 9, lines 34-37.

The device of Jacobs has a reduced number of drivers and receivers for each semiconductor segment (32). The device of Jacobs utilizes solder balls that must be so small that the impedance between the internal circuits on the semiconductor segments 32 and the wiring of interposer 9 is substantially constant in order for an interposer to

be used without receivers or drivers. The preferred size of the solder balls is 1-3 mils in diameter. Also, the primary reason for substrate 10 being silicon is that the small solder balls on the semiconductor segments 32 are very sensitive to stress and are subject to failure due to thermal coefficient of expansion mismatches between the semiconductor segments 32 and the substrate 10. The smaller the solder ball, the more likely that thermally induced stress will result in a connection failure. See Column 10, lines 53-66.

Kumazawa discloses an electronic component unit having two electronic components which are disposed in parallel with each other and each of which has an internal electric circuit therein. Electrode pads are provided on the opposed surfaces of the two electronic components and are electrically connected to the internal electric circuits. The pads on one of the electronic components are respectively electrically and mechanically connected to the corresponding pads on the other electronic component by solder bumps. See Abstract. The device of Kumazawa has metallic bonding elements in which "the ratio of the surface area of one of the pads of at least one of said first and second electronic components to the volume of the metallic bonding element connected to said one pad is different from the ratio of the surface area of the other pad of said one electronic component to the volume of the metallic bonding element connected to said other pad, each of the pads of said first and second electronic components being bonded to an associated metallic bonding element over substantially the whole area of the pad, whereby the shape of the metallic bonding element connected to said one pad of at least one of said first and second electronic components is different from the shape of the metallic bonding element connected to said other pad." See Column 2, lines 35-48.

The device of Kumazawa has solder bumps of differing shape (from a spherical to hand drum shape) and electrode pads of differing size. The solder bumps used by the device of Kumazawa have a diameter of 0.6 mm. The solder bumps of

differing shape and electrode pads of differing size are used to relieve stress to the outer portions of substrates 3 and 9 due to thermal expansion as compared to central portions of substrates 3 and 9.

The Office Action fails to establish a *prima facie* case of obviousness of the subject matter of claim 88. Courts have generally recognized that a showing of a *prima facie* case of obviousness necessitates three requirements: (i) some suggestion or motivation, either in the references themselves or in the knowledge of a person of ordinary skill in the art, to modify the reference or combine the reference teachings; (ii) a reasonable expectation of success; and (iii) the prior art references must teach or suggest all claim limitations. See e.g., In re Dembiczak, 175 F.3d 994 (Fed. Cir. 1999); In re Rouffet, 149 F.3d 1350, 1355 (Fed. Cir. 1998); Pro-Mold & Tool Co. v. Great Lakes Plastics, Inc., 75 F.3d 1568, 1573 (Fed. Cir. 1996). The references used in the Office Action fail the first prong of obviousness in that one skilled in the art would not be motivated to combine the cited references in light of the totality of information disclosed in each reference.

In the present case, the combination of references fails to teach or suggest all the claim limitations. Also, the combination of the device of Jacobs with either Stone of Kumazawa cannot be squared. There is no motivation in the references to combine their teachings in the manner suggested in the Office Action.

Many of the deficiencies of Stone acknowledged in the Office Action are not remedied by the combination of Stone with Jacobs. Jacob fails to teach or suggest a passive circuit element is being separated from the silicon substrate by a portion of the insulating layer; wherein two or more of the individual solder ball leads use different types of solder having differing melting points, and a portion of the insulating layer having a thickness such that the passive circuit element is electrically shielded from the

silicon substrate. To the contrary, Jacobs merely discloses the use of drivers, receivers and amplifiers, which are active circuits; and therefore, also fails to teach or suggest an insulating layer having a thickness such that the passive circuit element is electrically shielded from the silicon substrate. Jacobs also fails to teach or suggest two or more of the individual solder ball leads using different types of solder having differing melting points.

In addition, as noted above, a key factor in creating the low noise environment which is required for the operation of the high performance integrated packaging structure of Jacobs is the use of three-dimensional power planes. The device of Stone discloses only two dimensional power planes. Accordingly, there is also no motivation for the combination of Stone and Jacobs.

The combination of Stone and Jacobs with Kumazawa also fails to remedy all of the deficiencies in Stone acknowledged by the Office Action. In particular, Kumazawa fails to teach or suggest an insulating layer on at least one silicon substrate; wherein the passive circuit element is being separated from the silicon substrate by a portion of the insulating layer; and a portion of the insulating layer having a thickness such that the passive circuit element is electrically shielded from the silicon substrate.

Kumazawa also fails to disclose a package structure with a reduced number of drivers and receivers or three-dimensional power planes as required by Jacobs. The solder balls for Kumazawa have a diameter of 0.6 mm. The difference in size of the solder balls for Kumazawa are 8 to 24 times larger than those necessary for Jacobs. Although the Office Action mentions that Kumazawa fails to mention that the size of solder balls are critical, such a reduction of in size to each solder ball would increase the stress for each solder ball which is directly against the purpose of Kumazawa. As noted in Jacobs, due to the size of the solder balls, stress is a factor which is remedied by the

use of a silicon substrate. However, Kumazawa addresses stresses bourn by its solder balls by varying the shape of the solder balls. Therefore, there is no motivation for the suggested combination of Jacobs and Kumazawa.

Thus, the combination of Stone, Jacobs and Kumazawa fails to teach or suggest all the limitations of claim 88. In addition, because of the significant differences in structure and operation of the three cited references, there is no motivation for combining their teachings in the manner suggested. Accordingly, the rejection of claim 88 should be withdrawn. Claims 92-95, 97-100, 105, 107-118 and 123 depend from claim 88 and are allowable over the combination of Stone, Jacobs and Kumazawa at least for the reasons mentioned above with respect to claim 88.

Claim 106 stands rejected under 35 U.S.C. 103(a) over Stone and Jacobs (and presumably Kumazawa; see rejection of claim 88) in further view of Yamazaki (U.S. Patent No. 6,002,161). Claims 101-104 stand rejected under 35 U.S.C. 103(a) over Stone and Jacobs in further view of Farooq et al. (U.S. Patent No. 5,912,044). Claims 119-121 stand rejected under 35 U.S.C. 103(a) over Stone, Jacobs and Yamazaki in further view of Solberg (U.S. Patent No. 6,121,676). Reconsideration and withdrawal of these rejections are respectfully requested.

Claims 101-104, 106, and 119-121 depend, directly or indirectly, from claim 88 and are allowable over Stone, Jacobs, Kumazawa, Yamazaki, Farooq and Solberg for the reasons mentioned above with respect to claim 88. Accordingly, the rejection of claims 101-104, 106, and 119-121 under 35 U.S.C. § 103(a) should be withdrawn. Moreover, there is no motivation for combining four or more references to attain the claimed invention. Clearly, hindsight is being used in these rejections.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

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Respectfully submitted,

By_____

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